Exceedance Probability Curves & Stacked Bars

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Background

Wildfires can cause significant negative impacts to private property, infrastructure, recreation, and natural resources, including water, timber, and wildlife habitat. However, there can be ecological benefits to fire, particularly in areas where assets are absent. Every year individual units, area commands, and regional multi area commands are challenged with the task of prioritizing resources to protect highly valued resources and assets (HVRAs) and still balancing the benefit of fire. The prioritization process varies among different units and geographic areas, but analyses are generally a-spatial, not quantitative, and frequently do not account for predicted fire behavior or growth.

Exceedance probability (EP) output can be used to compare multiple incidents or show the effect fire has on highly valued resources and assets (HVRAs). Output is displayed two ways: curves or stacked bars. These products graphically depict the relative benefit and/or loss to HVRAs by a given fire and comparisons among individual fires can be made. A mean conditional net value change (cNVC) by HVRA was obtained from the Pacific Northwest all-lands, quantitative wildfire risk assessment (QWRA). The product is a series of curves and a stacked bar chart by HVRA displaying a net expected loss or benefit. These graphs can provide decision makers with a quantitative metric of potential loss or benefit to help aid in the difficult task of managing a fire.

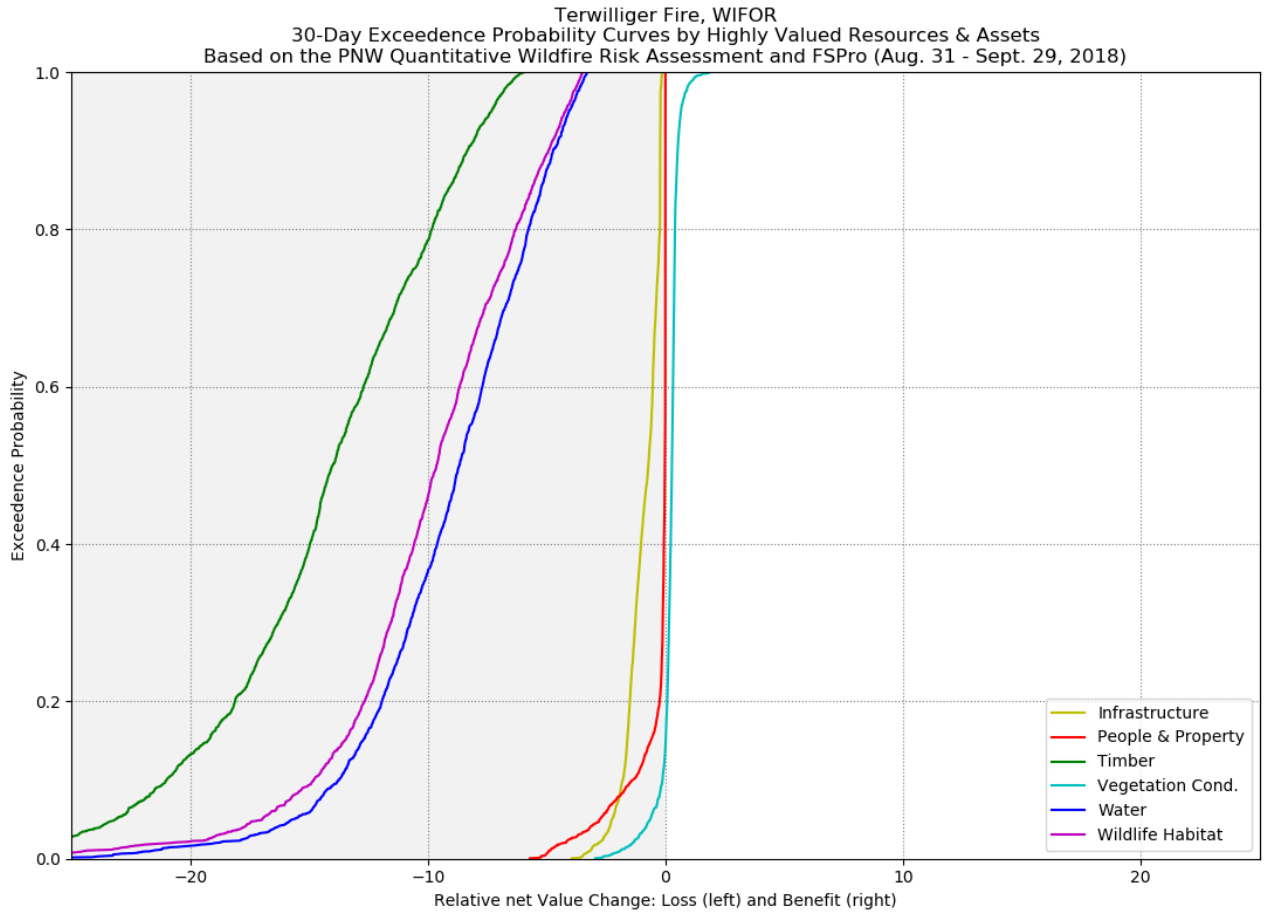
Interpretation

Below is (1) an EP curve, (2) stacked bar, (3) screen capture of the 30-day FSPro run for the Terwilliger Fire, ORWIF (Aug. 31 – Sep. 29), and (4) the list of the HVRAs from the PNW QWRA.

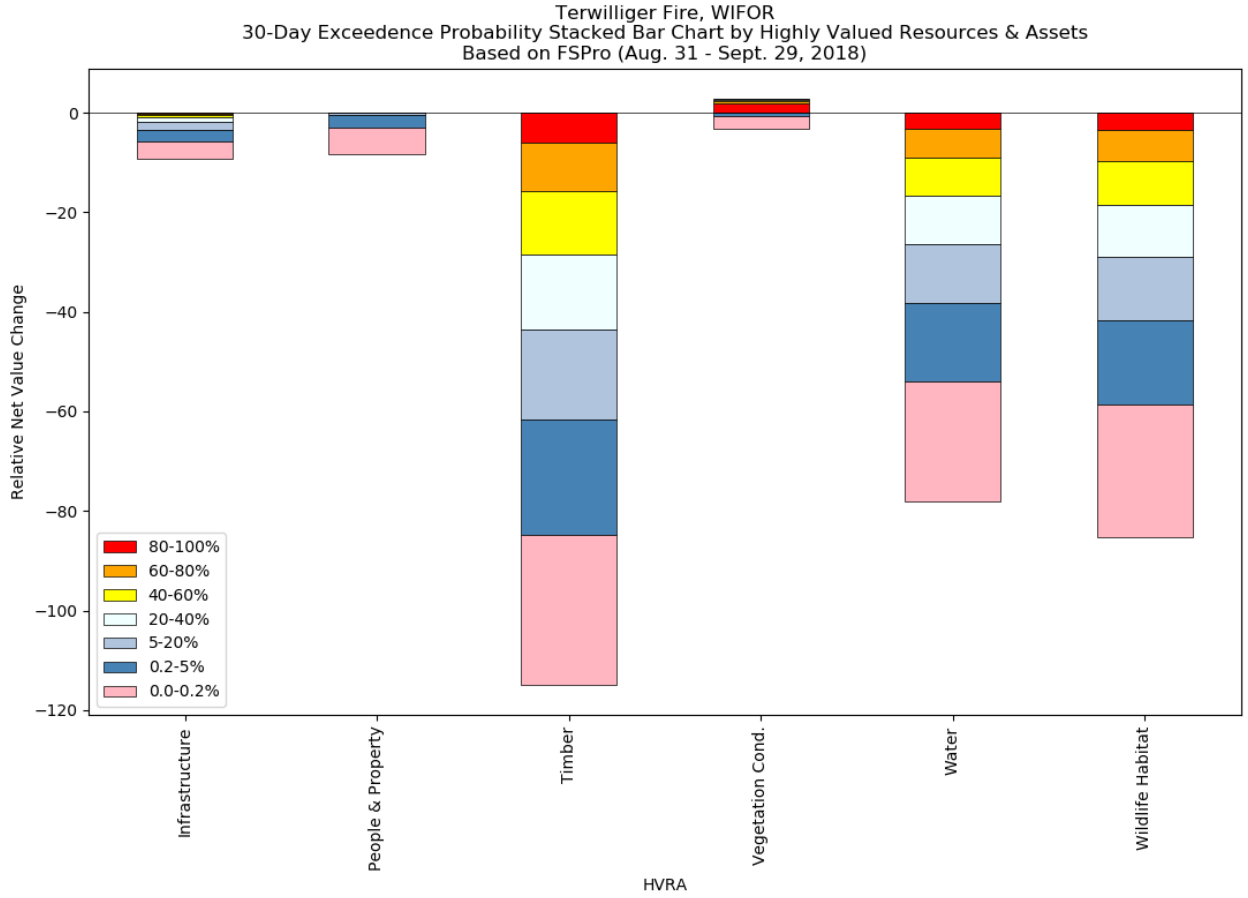
(1) Using the EP curve graphic, find the 0 line (center). The lines represent HVRA categories. Expressed as a relative net-value-change, curves on the right are positive (a benefit); curves on the left are negative (a loss). The further you go to the right or left, the greater the benefit or loss.

    The best place to start is at the top and represents the burnable fuels surrounding the ignition. Vegetation condition is the only HVRA group that shows a benefit (mild). However, as the FSPro bands reach outward this turns to a mild loss around the 40% mark (i.e., there is a 60% chance over the next 30 days that there will be a benefit to vegetation condition).

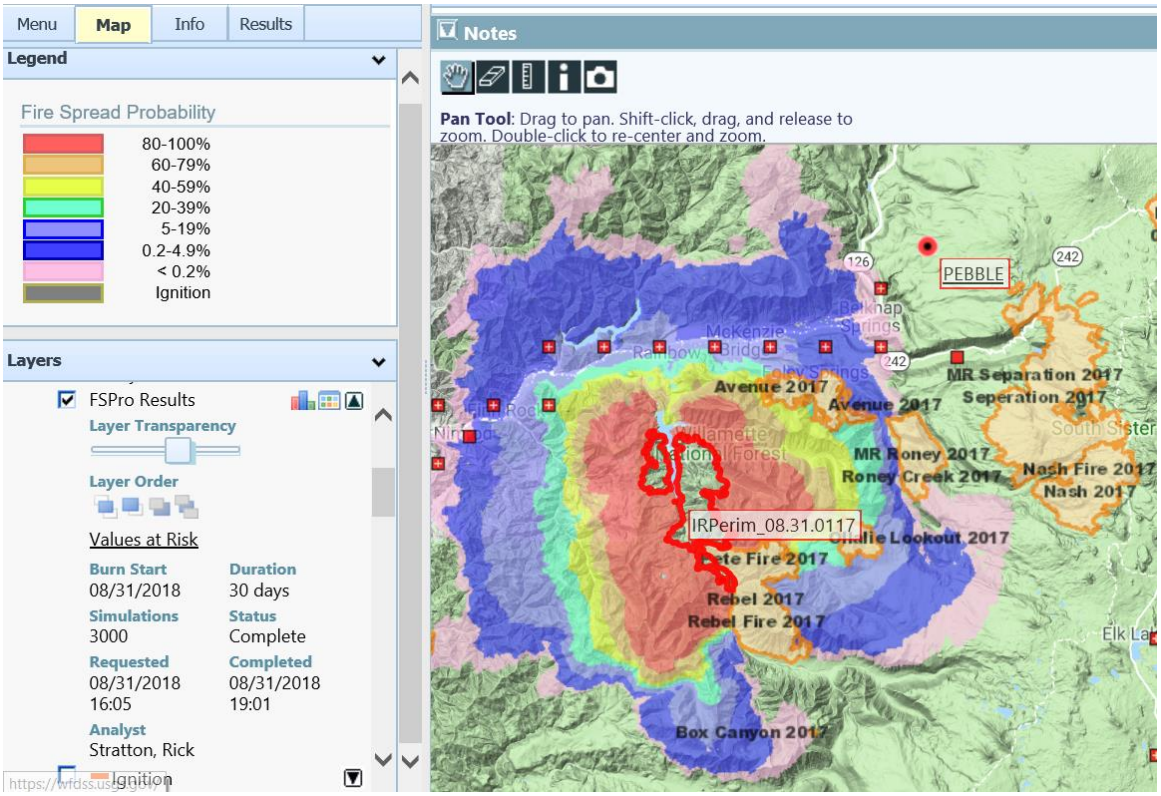
    People and property and infrastructure show a mild loss. Water, which includes municipal intakes and post-fire erosion, and wildlife, show a moderate loss. Wildlife habitat of concern include northern spotted owl, bull trout, and Chinook salmon. Merchantable timber, which includes private, is the HVRA category that shows the greatest potential for loss over the next 30-days, barring suppression.



(2) The stacked bars are another way to display the data—a way to see into each curve. Bars stacked upward are a benefit; bars that point downward are a loss. You will note the stacked bar colors correspond to the FSPro probability bands. The HVRA category with the highest probability—in red—is timber (a loss).



(3) 30-day FSPro by Rick Stratton (Aug. 31 – Sep. 29).



(4) Highly Valued Resources and Assets and sub-HVRA identified for the Pacific Northwest Quantitative Wildfire Risk Assessment and associated data sources (from the assessment report from Pyrologix LLC, dated April 10, 2018). The horizontal bar chart, at the bottom of the page, highlights the number of times a fire in FSPro encounters an individual HVRA or HVRA category.

HVRA & Sub-HVRA	Data source
Infrastructure	
Electric transmission lines – high & low voltage	Electric Power Transmission Lines extracted from the Homeland Security Infrastructure Program (HSIP) database.
Railroads	Railroad features extracted from the Homeland Security Infrastructure Program (HSIP) database.
Roads – Interstates and State highways	Interstates and highways extracted from the Homeland Security Infrastructure Program (HSIP) database. Removed smaller roads (SHIELD_CL=0) from highways.
Communication sites and cell towers	Communication sites, towers, and antennas and cell towers extracted from the Homeland Security Infrastructure Program (HSIP) database.
Seed orchards	Extracted from the Pacific Northwest Region Corporate database to represent seed orchard assets across the Region.
Sawmills	Wood Product Manufacturing Facilities extracted from the Homeland Security Infrastructure Program (HSIP) database.
High and low developed rec sites	Recreation sites/structures mapped by USFS, USFWS, NPS, BLM, ODF, and DNR and including state, county, and local parks and campgrounds. High vs. low investment level assigned based on dataset attributes.
Ski Areas	OR and WA ski area boundaries, digitized outer edge and infrastructure using Google Earth imagery
Historic buildings	Historic buildings as recorded by the National Register of Historic Places
People and Property	
Where People Live (WPL) by density class	Housing density classes as developed by the West Wide Wildfire Risk Assessment project
USFS Private Inholdings	Private inholdings on USFS lands extracted from the Basic Ownership layer by querying "NON-FS". NPS lands were removed from the NON-FS lands before including in this dataset. Refined to private ownership using BLM Ownership (OWNERSHIP_POLY) and BLM Surface Management Agency (BLM_SMA_FS_update).
Timber	
USFS Active Management and NWFP Matrix Lands	A Spatial Database for Restoration Management Capability on National Forests in the Pacific Northwest USA, (Ringo *et al.*, 2016). Matrix lands in OR and WA from Northwest Forest Plan.
Tribal Owned/Colville Reservation Commercial Timber	American Indian/Alaska Native/Native Hawaiian (AIANNH) Areas Shapefile from U.S. Census Bureau as Tribal ownership overlay along with Colville Reservation Commercial forestland
Private Industrial	Privately owned, industrial timber lands extracted from the Atterbury Consultants ownership maps for Oregon and Washington (selected attributes containing IFPC, REIT, and TIMO)
BLM Harvestable/Potential	Harvest Land Base from the ROD for western OR, O&C lands, Coos Bay Wagon Rd, Public Domain lands, and the BLM-owned polygons from the E. WA Resource Management Plan.
State owned for Oregon and Washington	State-owned lands in OR and WA excluding State Parks, State Fish and Wildlife lands, and Parks and Recreation lands.
Fire Regime Groups 1,3,4/5	R6 Forest Structure Restoration Needs Update Analysis – (DeMeo *et al.*, In Press)
Size classes <10in., 10-20in., >20in.	R6 Forest Structure Restoration Needs Update Analysis – (DeMeo *et al.*, In Press)
Vegetation Condition	
Seral state departure by FRG group	R6 Forest Structure Restoration Needs Update Analysis – (DeMeo *et al.*, In Press)
Watersheds	
Watersheds	Washington Drinking Water System Boundaries for watershed boundaries and surface water intake locations Oregon Surface Drinking Water Source Areas and intake locations from EPA Safe Drinking Water Information System (SDWIS)

Erosion potential	Developed by USFS Remote Sensing Applications Center (RSAC)
Wildlife	
Marbled murrelet	U.S. Fish and Wildlife Service, Endangered Species Program, ECOS Joint Development Team
Northern spotted owl	Predicted habitat suitability map (Glenn *et al.*, 2017)
Sage grouse habitat	Wildland Fire Decision Support System (WFDSS) - 2015 greater sage grouse (GRSG) Land Use Plan (LUPs) Allocations
Resistance/Resilience class	USDA - Natural Resources Conservation Service, Index of Relative Ecosystem Resilience and Resistance across Sage-Grouse Management Zones
Bull trout	StreamNet Generalized Fish Distribution, Bull Trout (January 2012)
Chinook salmon	U.S. Fish and Wildlife Service, Endangered Species Program, ECOS Joint Development Team
Coho salmon	U.S. Fish and Wildlife Service, Endangered Species Program, ECOS Joint Development Team
Steelhead trout	U.S. Fish and Wildlife Service, Endangered Species Program, ECOS Joint Development Team
Redband trout	Non-Anadromous Redband Trout (RBT) Range-wide Database - ODFW
Coastal cutthroat trout	StreamNet Generalized Fish Distribution, Coastal Cutthroat Trout (January 2012) -
Lahontan cutthroat trout	StreamNet Generalized Fish Distribution, Lahontan Cutthroat Trout (January 2012)